APPENDIX I

a set of categorical variables X2 of dimension MxNInput: Output: an expanded dummies DX Process: Set DX as an empty matrix For each of the categorical variable x2 in X2Calculate k -- the number of its categories Initialize a matrix TX of size Mx k with 0; For i = 1 to M, x = x2(i)q is the index for x; $(1 \le q \le k)$ TX(i, q) = 1End For Find the column that has least 1s, say it is column d; $(1 \le d \le k)$; Delete column *d* from *TX*; Concatenate TX to DX vertically; //DX = [DX TX]; Record category index and drop category name **End For**